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Season's Greetings

The "Spirit of Christmas" is expressed in many joyous ways including the familiar carols, exchange of gifts and festive dinners that are well known to all of us. We are, however, wont to forget that the holiday also is the celebration of the birth of Christ who created the true spirit by his supreme sacrifice for all mankind. I sincerely hope that, as this holiday approaches, the military and civilian members of the Navy Medical Department, their families, our patients and friends, wherever they are and whatever their faith may be, can obtain some comfort from the examples of sacrifice set by the Messiah.

I am ever mindful of the contributions you are making today and of the family loneliness that accompanies the separations or losses peculiar to a career with the military. Each of you is keeping bright the fires of the Christmas Spirit by laboring to protect freedom from those who would destroy it, by comforting and aiding the sick and injured, and by your sacrifices to bring about a true peace on earth. I am privileged to be able to participate with you in this contest for peace and freedom and proud of the splendid accomplishments of the Navy Medical Department.

To all I send my best wish for a Merry Christmas and the sincere hope that the New Year will be both rewarding and happy.

R. B. BROWN
Vice Admiral, MC, USN
Surgeon General

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U.S. NAVY MEDICAL NEWS LETTER VOL. 48 NO. 12

ISOLATED DISEASE OF THE MIDDLE LOBE AND LINGULA *

*Rudolph C. Camishion MD, Allen L. Davies MD** and Walter F. Ballinger, II MD†, Philadelphia, Pa. Dis Chest 50(1): 67-71, July 1966.*

In 1946, the significance of atelectasis of the middle lobe was discussed independently by Zdansky¹ and by Brock.² Zdansky described two adult patients who had isolated atelectasis of the middle lobe secondary to compression of the middle lobe bronchus by a calcified lymph node. He termed the right middle lobe, because of its particular vulnerability, the "locus minoris resistentiae." Brock clarified the pathophysiology of compression of the right middle lobe bronchus in his work. "The Anatomy of the Bronchial Tree." He pointed out that the right middle lobe is surrounded by lymph nodes which drain the middle as well as the lower lobe and that compression of the right middle lobe bronchus is often a consequence of chronic infection and lymphadenitis.

Evarts Graham and associates³ coined the term "middle lobe syndrome" in 1947 and reported 12 cases in which compression of the right middle lobe bronchus was secondary to enlarged lymph nodes. The pathologic findings in the pulmonary parenchyma of these cases consisted of atelectasis, fibrosis and bronchiectasis.

Subsequently, Paulson and Shaw⁴ reported 32 cases similar to those of Graham, but only 15 had lymphadenopathy. Twenty-six patients reported by Harper and his associates⁵ were believed to have obstruction caused by involvement of the peribronchial lymph nodes with resulting nonspecific pneumonitis. Bronchial obstruction secondary to chronically inflamed lymph nodes is not confined to the middle lobe, since the lingular segment of the left lung is occasionally involved by the same process.

Although the pathogenesis of the clinical, radiologic and bronchoscopic manifestations of the middle lobe syndrome is well known, the differential diagnosis is extremely difficult on clinical grounds and can only be confirmed by exploratory thoracotomy.

In a detailed report of seven cases, Lindskog and Spear⁶ pointed out that bronchial obstruction can be caused by disease entities other than lymphadenopathy. All of these patients presented with the classic symptoms and radiologic picture of the middle lobe syndrome; however, on exploratory thoracotomy, seven different pathologic diagnoses were discovered.

Rosenman⁷ has suggested that the term "middle lobe syndrome" should include all cases of middle lobe atelectasis regardless of etiology and that the term "middle lobe disease" be applied to those specific cases of chronic pneumonitis secondary to enlarged, chronically infected lymph nodes.

Because of the recognized difficulty in making a correct pathologic diagnosis from the clinical picture in cases of middle lobe syndrome, we are reviewing a 14 year experience which demonstrates the wide variety of pathologic conditions encountered. This material will be presented from the aspects of clinical symptoms, radiographic and pathologic findings and surgical management.

Clinical Material

Between December 31, 1949 to January 1, 1964, a clinical diagnosis of the "middle lobe syndrome" was made on 72 patients at the Jefferson Medical College Hospital. In five there was isolated involvement of the lingula of the left upper lobe. The records of these patients demonstrate the difficulty of making a precise preoperative diagnosis.

Forty-four of the patients were men and 33 were women. A predominance of men was also reported by Paulson and Shaw.⁴ There were only two Negroes, neither of whom proved to have tuberculosis. The largest numbers were in the fifth through seventh decades which corresponds well with the greater incidence of chronic pulmonary disease among older patients. This does not agree with the report of Paulson and Shaw⁴ in which the highest incidence was found in the second and third decades with a rise again in the fifth decade.

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Symptomatology

The symptomatology of the middle lobe syndrome is similar to that of chronic pulmonary infection in general. Chronic cough appeared most frequently, followed by sputum production and then by chest pain and hemoptysis. All of the symptoms encountered are listed in Table 1.

Radiologic Findings

The radiologic appearance of the typical middle lobe syndrome is that of chronic atelectasis and pneumonitis. This picture used to be termed interlobar effusion until 1936 when Hampton and King⁸ pointed out the correct interpretation. Preoperative chest films were available for review in 70 of the cases in this series. The radiologic diagnoses reported are shown in Table 2. More than one radiologic description was often noted.

It is important to obtain a lateral x-ray film because an atelectatic right middle lobe or lingula can be missed on the conventional posteroanterior projection. Bronchography was carried out on only a few patients. Bronchoscopy was performed in most cases, the predominating findings being inflammation and narrowing of the middle lobe bronchus. In none did this examination obviate the need for exploratory thoracotomy. It is interesting to note that of eight cases of bronchogenic carcinoma in this series, the correct preoperative diagnosis was made on only three occasions.

Primary Pathology

Although some surgical specimens contained more than one pathologic process, the primary causes of isolated middle lobe disease could be separated into the following groups (Table 3):

1. No bronchial obstruction (41 cases)

In 27 specimens, no element of intraluminal or extraluminal obstruction of the middle lobe bronchus could be found. The major pathologic processes in these cases were bronchiectasis and chronic pneumonitis. It is possible that bronchiectasis was not always limited to the middle lobe since bronchography had not been performed in all cases. However, plain chest x-ray films revealed abnormality only of the middle lobe. Bronchiectasis is a common pathologic finding in bronchial obstruction, but here the disease is secondary rather than primary. Whether bronchial obstruction had existed and caused bronchiectasis and then resolved is not known.

The remainder of the cases in this group had parenchymal rather than bronchial disease.

2. Extraluminal bronchial obstruction (18 cases)

These cases were closest to those originally described as the "middle lobe syndrome." The middle lobe bronchus was obstructed by lymph nodes in 16 cases; in seven by tuberculous lymphadenitis, in three by asbestosis involving peribronchial nodes, in three by chronic nonspecific lymphadenitis and in three by anthracosilicotic nodes. In the remaining two cases, the middle lobe bronchus was obstructed by an extraluminal hamartoma in one and by metastatic carcinoma in the other.

3. Intraluminal bronchial obstruction (18 cases)

The most common cause of intraluminal obstruction of the middle lobe bronchus was bronchogenic carcinoma (eight cases). In five specimens, the middle lobe bronchus was involved in a fibrous stenosis of unknown cause. In three, the bronchus was obstructed by a foreign body which had produced chronic distal inflammation. A chondroma obstructed the bronchus in one and in another, the only etiologic agent found was an inspissated mucous plug.

Surgical Management

All patients underwent exploratory thoracotomy. In 60, right middle lobectomy alone was carried out. In four additional cases, the superior segment of the right lower lobe was also resected in order to remove pulmonary tissue that had been affected by spreading inflammation. In the five cases of isolated disease of the lingula, a lingulectomy was all that was deemed necessary. Pneumonectomy was performed on eight in whom bronchogenic carcinoma was found.

Discussion

The variety of pathologic conditions that produce the clinical picture of the middle lobe syndrome is well illustrated in our series with 16 distinct pathologic entities among the 77 patients. The pathophysiology of bronchial obstruction and distal infection has been mentioned heretofore; however, this obstruction can be due to a variety of causes other than enlarged inflamed lymph nodes as originally described by Graham and co-workers.³ In this series, no bronchial obstruction was found in 41 cases. Extraluminal or intraluminal bronchial obstruction was present in 18 cases each. We believe that the term "middle lobe syndrome" should be used as a

Table 1—Frequency of Symptoms

Chronic cough	57	Dyspnea	14
Sputum production . . .	40	Weight loss	12
Chest pain	35	Fatigue	12
Hemoptysis	34	Wheezing	7
Fever	20	Asymptomatic	5

clinical diagnosis for all cases of atelectasis and pneumonitis regardless of etiology in which extra or intraluminal bronchial obstruction exists. Those cases that show no evidence of bronchial obstruction merely represent pulmonary disease which happens to be localized in the middle lobe or lingula. The term "middle lobe disease," as suggested by Rosenman⁷, could then be used in those specific cases of middle lobe atelectasis and chronic pneumonitis secondary to enlarged chronically inflamed lymph nodes. In our series, only 16 cases fit the original description by Graham and colleagues³ of obstruction due to chronic lymphadenitis, but the pathologic appearance of the distal pulmonary parenchyma was similar in all of the cases regardless of the etiology of the proximal bronchial obstruction. Thus, in this series there are 36 cases which fit the category of middle lobe syndrome and 16 of middle lobe disease. Bronchial obstruction is often caused by bronchogenic carcinoma and the middle lobe bronchus is as likely as others to be so attacked. This should always be kept in mind in the differential diagnosis of the middle lobe syndrome.

Summary

1. The records of 77 patients with isolated disease of the middle lobe or lingula compiled over a 14-year period at the Jefferson Medical College Hospital were reviewed.

2. There were 44 men and 33 women, the greatest incidence being between the ages of 40 and 70.

3. The symptomatology is similar to that of chronic respiratory disease in general with cough, sputum production, chest pain and hemoptysis encountered in the majority of cases.

4. The radiologic appearance of the middle lobe syndrome is that of chronic atelectasis and pneumonitis. It is always necessary to obtain a right lateral x-ray film because the atelectatic middle lobe or lingula may be hidden on conventional posteroanterior views.

5. Exploratory thoracotomy was carried out on all patients. In most cases, only the involved lobe was removed.

6. Sixteen different pathologic entities causing the middle lobe or lingular disease were encountered.

Table 2—Radiologic Findings

20	density of unknown etiology
18	atelectasis
9	consolidation
8	bronchiectasis
5	bronchial obstruction
6	pleuritis
6	possible carcinoma
3	effusion
6	nonspecific inflammatory reaction
1	abscess
1	cyst
1	anthracosis
1	calcification

7. The clinical diagnosis of "middle lobe syndrome" should be made when the middle lobe bronchus is obstructed, regardless of whether the obstruction is intra- or extraluminal. Thirty-six of our cases fit this description. The exact etiology can only be ascertained in the pathology laboratory.

8. The term "middle lobe disease" should be used in cases of chronic nonspecific pneumonitis secondary to bronchial obstruction by chronically inflamed lymph nodes. Sixteen of our cases are of this type.

Table 3—Pathologic Findings

I. No bronchial obstruction	
Bronchiectasis	27
Lipoid pneumonia	5
Chronic nonspecific pneumonitis	6
Pulmonary infarct	2
Pulmonary cyst	1
	—
	41
II. Extraluminal bronchial obstruction	
Hamartoma	1
Tuberculous lymph nodes	7
Asbestos lymph nodes	3
Chronic lymphadenitis	3
Metastatic carcinoma	1
Anthracosilicotic lymph nodes	3
	—
	18
III. Intraluminal bronchial obstruction	
Bronchogenic carcinoma	8
Fibrous bronchial stenosis	5
Foreign body	3
Chondroma	1
Mucous plug	1
	—
	18

9. Cases of isolated middle lobe abnormality that occur without evidence of bronchial obstruction should not be included in either of the above categories.

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(The omitted figure may be seen in the original article.)
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A REVIEW OF 26 YEARS' EXPERIENCE WITH PULMONARY RESECTION FOR METASTATIC CANCER *

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Dis Chest 49(6): 587-594, June 1966.

The management of patients with pulmonary metastases has undergone important changes during the last four decades. Although considered at one time evidence of a near hopeless prognosis, secondary pulmonary malignancy today can be so managed as to prolong substantially the survival time for many persons and even cure a significant number.

After Divis successfully resected a metastatic pulmonary tumor in 1927, operations for pulmonary metastases were done so sporadically that during the next 38 years only about 600 resections were reported in the literature. Indeed, it has been difficult to obtain well-done survival statistics on any large number of patients. Only two publications include five-year cumulative survival figures involving more than 50 patients.

The purpose of this paper is to present the total experience at the University of Minnesota Hospitals in the surgical treatment of pulmonary metastases. During the past 26 years, pulmonary resection for metastatic malignancy has been performed on 61 patients; 53 had the procedure carried out more than five years ago. The cumulative five-year survival of this latter group of patients was 24 percent with 13 of them living five years or more after resection of the metastatic tumors. We have included in this series those individual cases which others reported earlier, and their records as well have been brought up to date.

* Presented at the 31st Annual Meeting, American College of Chest Physicians, New York, June 17-21, 1965. From the Department of Surgery, University of Minnesota Medical School.

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Analysis of Findings

Primary Lesion

The primary source of malignancy was carcinoma in 39, sarcoma in 18, and Wilms' tumor in four cases. Adenocarcinoma of the colon, rectum and kidney were the most common primary tumors and accounted for 32 percent of the 61 cases of metastatic pulmonary neoplasms.

Evidence of local spread or hematogenously disseminated extrapulmonary metastases were found in over 50 percent of the primary tumors. Metastatic involvement of regional lymph nodes was noted in 27 percent of the patients, whereas isolated metastases in bone, liver, thyroid, or brain occurred in 13 percent. Direct extension of tumor to continuous organs could be demonstrated in ten of the 61 cases.

The route of metastatic spread could be correlated with tumor cell type. Ten of the 11 cases of cancer of the colon and rectum demonstrated tumor extension to regional lymphatics or adjacent organs. Invasion of a major renal vein was identified in the operative specimen of six of the patients with adenocarcinoma of the kidney. Each of the five cases with carcinoma of cervix showed evidence of spread to the vagina and pelvic wall. Isolated bone metastases were noted in four of the 18 sarcomas.

The tendency of adenocarcinomas of the kidney to metastasize to the lung could also be related to the size of the primary tumor. Seven of the nine renal adenocarcinomas measured over 5 cm in diameter, while the remaining two were 4 cm. These facts are in accord with a series of 149 cases of renal

adenocarcinoma reported by Bell. Sixty-six of the 84 tumors in his series measuring over 5 cm showed metastases to the lung while only five of the 65 measuring 5 cm or less had metastasized.

In our study, less readily identifiable prognostic import appears attributable to the presence of lymphatic metastases or evidence of venous invasion by the primary tumor when that person also reveals a pulmonary metastasis. Of the five patients whose primary malignancy was a carcinoma and who survived five years after pulmonary resection, lymphatic metastases were noted in two patients, and renal vein invasion in another.

However, the confirmed presence of hematogenously disseminated extrapulmonary metastases clearly was an ominous finding. Of the eight cases who demonstrated isolated extrapulmonary metastasis prior to (or at the time of recognition of pulmonary metastasis), only one lived more than 22 months. The exception was a 37-year-old woman with a granular cell myoblastoma of the thigh which was resected six years before the demonstration of intracranial and pulmonary metastases. This patient is alive without known recurrence of tumor seven years after resections of these metastases.

Age and Sex

Sixty-three percent of the patients were women and 37 percent were men. Wilkins and associates noted similar distributions in their series of 67 patients, 73 percent of whom were women.

The age of patients varied from 4 to 77 years and the average age was 42. Patients with metastatic carcinoma tended to be older (average age 46 years) than patients with metastatic sarcoma (average age 31 years). The peak incidence of finding metastatic tumors occurred in the fourth and fifth decades (50 percent). This is in contrast to other series where the corresponding patients were predominantly in the sixth and seventh decades of life.

Symptoms

Forty-two of the 61 patients were asymptomatic. Of the 19 with symptoms, hemoptysis was noted in ten. Yet, the presence or absence of this or other clinical signs was of little prognostic significance. In fact, of the patients who lived three or more years after pulmonary resection, 26 percent had pulmonary or chest wall symptomatology. In the cases surviving less than three years after pulmonary resection, 40 percent had symptoms.

The relative infrequency of symptoms in patients with resectable pulmonary metastasis is in sharp

contrast to the much more frequently symptomatic patients with primary carcinoma of the lung. Ninety percent of the latter have symptoms when seen for evaluation.

Roentgenograms

Pulmonary metastases were detected primarily by routine posterior-anterior and lateral roentgenograms taken during periodic (six-month) follow-up visits scheduled as a part of treatment for their primary cancer. Roentgenograms were available for review in 47 of the 61 patients. These roentgenographic examinations revealed 17 cases of multiple pulmonary metastases. In nine of 30 patients with roentgenographic evidence of isolated metastasis, examination of the gross pathologic specimen revealed multiple metastases.

Bronchoscopic Examination and Cytologic Studies

Bronchoscopy and bronchoscopic biopsy were performed in nine of the 61 patients. Positive histologic diagnosis was obtained in six. Cytologic studies from tracheobronchial secretions were rarely made otherwise because of the reported low incidence of malignant cells in sputa of patients with pulmonary metastases.

Time Interval Between Primary Operation and Resection of Pulmonary Metastases

The length of time between the initial treatment of the primary extrapulmonary neoplasm and the thoracotomy for pulmonary metastasis, ranged from 0 to seven years. In contrast to the findings of Ehrenhaft and co-workers in their series of 37 patients with pulmonary resection for metastatic disease, in our study there appears to be positive favorable prognostic correlation between the duration of time after the primary procedure and when the secondary operation occurred. For 12 patients with a time interval between the primary and secondary operation of less than one year, only 8 percent survived five or more years after pulmonary resection of the metastatic neoplasm. However, when the time interval between procedures was greater than five years, 46 percent of the patients lived five years or longer after removal of the pulmonary metastasis.

Location, Number and Size of Metastases

The findings revealed in the preoperative roentgenograms along with a study of the operative specimens suggests that at least 36 of the 61 patients had multiple parenchymatous metastases. More than

four metastatic nodules were noted in the pathologic specimen of 17 cases and the rest contained two to three foci. In this group, two or more lobes were involved 15 times, and bilateral chest involvement occurred in three persons. The location of the multiple and isolated metastases was divided uniformly among the various lobes. No evidence of preferential embolic sites corresponding to venous blood flow (as proposed by Kretz) could be identifiable. Neither did solitary metastases appear more often in basilar than apical lobes as had been reported by Willis.

Multiplicity of metastases significantly affected prognosis. Only four of the 36 patients with either preoperative roentgenographic findings consistent with multiple metastases or evidence of more than one metastasis in the operative specimen survived five years after pulmonary resection. Nine of 25 patients with isolated pulmonary metastases lived beyond five years. Of the 15 patients with multiple lobe involvement, only two were five year survivors. One of these survivors had bilateral chest metastases.

Metastasis size appeared to have little or no effect on the prognosis of the individual case. Five of the five-year survivors had tumors measuring over 4 cm in diameter. In fact, the largest tumor in the series (15 cm) was completely resected and the patient is still alive at seven years.

Tumor Spread from Metastatic Tumors of the Lung

Forty patients had pulmonary metastases confined to the lung as revealed by preoperative x-ray films or palpation at operation. In the remaining 21 cases, hilar and/or mediastinal lymph node metastases and/or invasion of mediastinum, pleura or chest wall were evident. It is important to consider the fact that none of these patients survived over 36 months and 20 died before 22 months.

Operative Procedures

Because of the possible need of subsequent resection of yet other tumor foci, limited excisions have been advocated whenever possible in this condition. Eighty-one operations were performed on 61 patients; 12 underwent multiple thoracotomies. The procedure mortality was 1.6 percent and a five-year cumulative survival of 24 percent was achieved.

In 62 percent of the patients (38 cases), the first operative procedure for metastatic pulmonary cancer was wedge or segmental resection. In the remaining 38 percent (23 cases) pneumonectomy or lobectomy

was done. The types of procedures used for those patients surviving three years or more after some form of pulmonary resection, and for those dying before that interval were rather similarly divided.

However, there is some suggestion that the extent of the pulmonary resection at times was too limited. In four patients who underwent wedge resection for isolated metastasis, the tumor recurred in the same lobe in two patients, at the wound site in a third and in the hilus of the ipsilateral lung in another case. On the other hand, two of these four patients have died since and another is near death, from extrapulmonary metastases.

Survival

Of the 61 patients,* 13 five-year survivors have resulted. An additional four persons are presently alive and seemingly free of malignant disease three years after resection. In the five-year survivor group, four have died subsequently. Three of these had recurrent carcinoma. One five-year survivor is still living with another (and unresectable) metastatic recurrence from a sublingual cylindroma. The remaining eight have been free of disease for periods of eight to 14 years.

Cumulative survival data have been obtained on all patients who have had pulmonary resection for metastatic cancer from 1939 to 1960. The number of survivors decreases sharply during the first two years and then levels off. Quite apparently, tumor persistence is much more likely to be recognizable in the first three years after pulmonary resection for metastatic disease.

Discussion

Prior to 1927, metastatic lung disease was rarely treated by pulmonary resection, probably in large measure as a reflection of the state of intra-thoracic surgery at that time. However, in the 1890's, Weinlechner, Krönlein, and Gerulanos reported resecting the thoracic wall for neoplasms that had invaded pulmonary parenchyma. These efforts, were, of course, prior to the modern development of thoracic surgical techniques.

From 1927 to 1937, Divis, Torek, and Röpke demonstrated that certain of these metastatic lesions were resectable. In 1939, Barney and Churchill provided strong evidence that a patient with pulmonary metastases might indeed be cured by resection of this distant spread.

* Follow-up evaluation has been completed for each patient as of June, 1965.

In July, 1933, Churchill reported a 2.5 cm metastasis from a renal adenocarcinoma by means of partial lobectomy. The patient survived 23 years after that procedure and eventually died of a coronary thrombosis.

In 1950, Hood and colleagues presented the entire Mayo Clinic experience consisting of ten patients. By 1964, this series had grown to 205 patients. Other centers have also revealed a burgeoning interest in the accomplishments possible with this stage of malignant disease by means of pulmonary resections.

Our experience with the surgical treatment of pulmonary metastases substantiates the high resectability rate of such lesions and emphasizes as well the potential value of operative therapy as a potentially curative procedure. Pulmonary resections were performed on 61 patients with a procedure mortality of 1.6 percent and five-year cumulative survival of 24 percent.

We have evaluated various factors that have been reported to influence survival, in order to establish the surgical indications for removal of secondary (and hopefully solitary) neoplasms. The cell type of the primary lesion, the presence or absence of clinical symptoms, and the results of the bronchoscopic examination did not appear to affect the prognosis. However, the interval between the primary operation and the appearance of a metastasis was directly proportional to survival time thereafter, when the group was considered as a whole. For in the individual case, however, a short time interval between the recognition of the primary and the secondary neoplasm, was not invariably associated with shortened survival time, nor did an extended lapse between primary lesion and appearance of pulmonary metastasis guarantee success.

Evidence of hematogenous spread to extrapulmonary organs, lymphatic dissemination to the hilus or mediastinal structures, and multiplicity of metastases were all bad prognostic omens. Multiple lobe involvement and bilateral chest metastases also augured poorly for survival but were not signs of incurability.

Others have also reported instances of resection for bilateral lung metastases in at least 12 patients, three of whom were alive five years after resection.

A limited resection was employed in the majority of patients in this series. Tumor recurrence following resection of metastases in four cases suggested that in these persons a wedge or segmental resection might have been too conservative.

Summary

(1) Pulmonary resection for metastatic pulmonary malignancy was performed on 61 patients with a cumulative five-year survival of 24 percent and hospital mortality of 1.6 percent.

(2) More than 50 percent of the primary lesions demonstrated at time of resection, prior to the recognition of the pulmonary metastases, evidence of either direct extension or disseminated metastases to extrapulmonary sites.

(3) Tumor cell type, presence or absence of clinical symptoms and results of bronchoscopic examination could not be positively or negatively correlated in post resection survival time.

(4) Time interval between primary operation and resection of metastases could (for the group) be correlated positively with patient survival time.

(5) Isolated hematogenously disseminated extrapulmonary metastases and/or tumor invasion into the hilum or mediastinum were noted in 28 patients and found to have unfavorable prognostic outlook. Only one patient lived beyond 36 months.

(6) Multiplicity of metastases significantly affected prognosis, but were not a sign of incurability.

(7) In 62 percent of the patients, the first operative procedure for metastatic cancer was a wedge or segmental resection. Evidence of local recurrence of tumor in four patients who underwent wedge resection for an isolated metastatic tumor suggests that the operation may at times be too conservative.

(The references and tables may be seen in the original article.)

IMMUNOLOGIC STUDIES IN TUBERCULOSIS: UTILIZING AGAR GEL DOUBLE-DIFFUSION PRECIPITIN SYSTEM *

CAPT Donald C. Kent MC USN, Chief of Medicine, U.S. Naval Hospital,
St. Albans, New York, *Amer J Med Sci* 252(2): 112/212-116/216, August 1966.

Serologic studies are now available to the clinician to aid in the diagnosis of some specific infectious disease processes. These have as their purpose the detection of an antibody in the serum which is assumed to be present as the result of sufficient exposure to a specific disease agent. In acute infections with some viruses, and with certain mycotic infections this is possible, because sufficient antibody development occurs due to the continuous multiplication of the organisms. But with other infectious disease processes, where the multiplication of the organisms is so irregular or so slow as to produce less antibody, this becomes more difficult. Such an infection is that caused by *Mycobacterium tuberculosis*.

At one time it was commonly considered that there was no circulating antibody associated with tuberculosis, however, with more refined techniques the presence of such circulating antibodies has been noted. The techniques have developed into two types, the first being the sensitized carrier system, in which a soluble mycobacterial antigen is absorbed to the surface of the carrier, such as red blood cells, and then in the presence of the antibody, agglutination occurs. Utilizing such a hemagglutination reaction as this, represented in particular by the Middlebrook-Dubos test, variable results have been obtained by different workers. These have ranged in a group of nontuberculous sera from no (Choremes and Anastasea) false positives to a high of 50% false positive (Schwartz *et al*) and with tuberculous sera from a rate of false negatives of 78% (Meissner and Orlowski) to that of 7% (Bray, Karigen and Urbain). With various workers the results have been most divergent, and because of the unpredictable and uncontrollable results, this type of study has been of little clinical aid.

Another type of serologic reaction is the precipitin reaction, in which antigen and antibody diffuse through a gel, and at the point of their contact a nonsoluble precipitate is formed. Representative of

this is the Parlett Gel Double Diffusion Test (Parlett and Youmans).

This report considers the clinical evaluation of this latter procedure on a clinical chest service, utilizing routine admissions to the service, a majority of the patients being tuberculous, but also utilizing some sera from nontuberculous chest patients.

Technique. Antigen produced from a growing culture of *Mycobacterium tuberculosis* was placed in 4 sterile tubes and diluted with buffered agar gel to concentrations of 5%, 10%, 25%, and 50%. A central layer of neutral agar was then placed in each tube, and over this was placed the test serum, also buffered with agar gel. The tubes were then allowed to incubate at 37° C. and were observed at 24, 48, and 72 hours. By diffusion through the gel, antigen, and antibody if present, meet in the central layer and if in proper proportions, form a visible precipitate. Negative and positive controls were always prepared for each test.

Since widely unequal concentrations of antigen and antibody will form soluble complexes instead of precipitates, the four variable antigen concentrations were set up in the test to effectively cover the reactive range of the unknown quantity of antibody present in the serum. Positive reactions depend on the noting of precipitate bands in one or more of the tubes. In the case of all negative reactions, the test was repeated at least two more times before called negative for any one patient.

Results. In this study, 175 serum samples were analyzed by the gel double-diffusion test. Twenty-three, or 13% of the group, were negative, the remainder being positive in various dilutions.

Table 1 reveals the results in patients with proven tuberculosis, the diagnosis established either by positive bacteriologic study or pathologic examination of tissue. The results were positive in nearly all such patients, being positive in 97% with pulmonary disease, and in 100% with extrapulmonary disease. Each of the 6 patients with proven tuberculosis but with skin test anergy had a positive gel diffusion test.

* Presented in part at the annual meeting of the American Academy of Tuberculosis Physicians, New York, New York, 19 June 1965.
The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

In 9 patients with multiple positive cultures for atypical mycobacteria, the test was positive in all instances. This is evidence for the nonspecificity of the reaction for *Mycobacterium tuberculosis* var. *hominis*. Similarly, there was 100% positivity in 11 patients with probable active tuberculosis, however, with no positive bacteriology reported at the time of the test performance.

TABLE 1.—TUBERCULOUS SERA

Diagnosis	Number Analyzed	% Positive
Proven pulmonary tuberculosis	69	97
Proven extrapulmonary tuberculosis	14	100
Proven tuberculosis, anergy	6	100
Atypical mycobacteriosis	9	100
Probable tuberculosis	11	100
Inactive tuberculosis	24	71

Twenty-four patients with inactive tuberculosis, as evidenced by stable chest roentgenogram, positive PPD skin test, and negative bacteriology, were studied. Of this group, 71% were positive by the gel diffusion technique.

Thirty-three sera were investigated in patients with proven nontuberculous disease. A significant percentage was reported to be positive, 57% of the group with positive PPD skin tests and 72% with negative reactions, as noted in Table 2. No particular pattern was elicited for any specific nontuberculous disease process, significant reactions being elicited in various disorders including asthma, carcinoma, sarcoidosis, and lymphoma (Table 2).

TABLE 2.—NONTUBERCULOUS SERA

Diagnosis	Number Analyzed	% Positive
Positive PPD	7	57
Negative PPD	18	72
Unknown PPD	8	50
Asthma	4	100
Carcinoma of lung	7	57
Sarcoidosis	4	50
Active fungal disease	3	33
Lymphoma	2	100

Table 3 notes the spectrum of test results related to patterns of reaction in the four test dilutions. As noted previously, 87% were positive. Of the various combinations of test results, as related to pattern of dilutions of positivity, the highest percentage was that of positive in all four dilutions, 30% representing this pattern. No specific pattern of reaction could be noted to be related to active disease. However,

TABLE 3—PATTERNS OF REACTION

Serum Concentration					With Positive Cultures	With Negative Cultures
5%	10%	25%	50%	%		
+	+	+	+	30	67%	33%
+	+	+	—	10	65	35
+	+	—	—	21	64	36
+	+	—	+	5	89	11
+	—	—	—	6	80	20
—	—	+	+	2	100	0
—	—	—	+	3	40	60
—	+	+	+	3	60	40
—	—	—	—	13	17	83
All other patterns				7	67	33
Total				100		

there was a definite correlation of negative reaction with the negativity of bacteriologic cultures, since negative reactions were found in 83% of the group with negative cultures.

Tests were repeated in a few instances; in 53% there was correlation as to positive or negative. Of the group with such positive correlation, represented by 10 serums, the correlation was exact in 20%. Eighty-nine percent reverted from negative to positive, 11% from positive to negative.

Pleural fluid was investigated in eight instances, as noted in Table 4. Results in this group of eight, equally divided between proven tuberculous and nontuberculous etiology, were such as to indicate a false positive rate of 25%, false negative rate of 0%. Further studies of pleural fluid, as well as other body tissue fluids, appear to be indicated. There was good correlation of results of serum and pleural fluid as to positive and negative reaction; no correlation was noted as to dilutions of positivity.

TABLE 4.—PLEURAL FLUID

Etiology	Number Analyzed	% Positive
Proven tuberculosis	4	100
Nontuberculous	4	25

Discussion. Various workers have evaluated this double gel diffusion technique in tuberculous and nontuberculous patients. The results, though variable in actual percentages (Parlett, Thurston and Steenken), have indicated that the sensitivity of the test for detection of antibody to mycobacterial antigens is greater if the test cases are limited to those with a definite diagnosis of tuberculosis established on the basis of bacteriologic isolation of *Mycobacterium tuberculosis*. Utilizing such tuberculous sera, Alshabkhoun *et al* reported 96% positive results. Similarly, Lester and Colton noted the test to be positive in 94% of their series. The reported result of 97% in this paper thus agrees favorably

with these reports in this group with proven active pulmonary tuberculosis.

The test sensitivity and specificity, however, has been reported to be considerably less certain by other workers. Thurston and Steenken reported in 1960 a rate of only 66% positive. Greene *et al* in 1961 reported a similar percentage of 65%. Most probably, differences in the definition of active disease, in the definition of positive and negative test results, as well as differences in the test antigen, may explain these differences (Parlett).

Considerable evidence has been accumulated to indicate that this test does evaluate the level of mycobacterial antibody in the serum, present in a percentage nearing 100% in the face of proven active tuberculous disease. Work has evidenced further that there appears to be a positive correlation between the presence of hypersensitivity as demonstrated by tuberculin skin tests and the presence of circulating antibody to tubercle bacilli demonstrated by this gel diffusion reaction (Parlett).

That this reaction is not specific for *Mycobacterium tuberculosis* is evidenced by the similar positive reaction rate in our group of patients with positive cultures for atypical mycobacteria.

The value of this procedure in the study of pleural fluid is well represented by this report. However, further study must be carried out to substantiate this fact.

The relative high percentage of positive reactions in the inactive tuberculous sera would suggest that this test cannot be used in its present form to differentiate between inactive and active tuberculosis. Previous reports have also made the same suggestion (Greene *et al*).

The data of this report indicate that this reaction has rather poor serodiagnostic specificity. This is indicated by the relatively high percentage of positive reactions in the group of nontuberculous sera. Alshabkhoun *et al* noted only 12% false positive reactions in a group of nontuberculous patients, however, they did report as high as 50% false positive reactions in a group of hospital employees, most of whom were engaged in the care of tuberculous patients. Other reported series of false positive reactions include 5% of nontuberculous patients reported by Greene *et al*, 24% of hospital employees reported by Lester and Colton, and 17% of nontuberculous patients studied by Thurston and Steenken. In our hands, this rate of false positivity in nontuberculous patients is considerably higher than these reported series. This appears to be the main drawback of the test, in the utilization of the results for diagnostically useful information. The antigen at

present utilized in the test is complex in that many different antigens from the H37Ra culture are in the mixture. Possibly with purification of this antigen immunologically, the specificity may be improved in the future.

In general, from this data, as well as from previous studies of other workers (Parlett) there appears to be no correlation of the reaction patterns with the disease process, except for the negative reaction in the group with negative cultures. The procedure must be performed, however, in these various dilutions to detect both those individuals with minimal and those with large amounts of circulating antibody (Parlett).

The antibody response in tuberculosis is at best poorly understood. The relation of this PGD test to this antigenic process is less well understood. In spite of these shortcomings, with the data as accumulated from this small group of sera, plus the data from other workers cited, this procedure is at present the best method now available to investigate this host antigen-antibody response in tuberculosis.

Summary and Conclusions. After a careful review of our results a series of conclusions may be made.

1. If the double diffusion precipitin test is positive, the clinical suspicion of tuberculosis is increased, especially if all tubes are positive. However, because of the high percentage of false positives, the test is not diagnostic of tuberculosis.
2. If the test is negative in all dilutions, and remains so on repeated occasions, the suspicion of nontuberculous disease is increased.
3. One cannot use the test to differentiate active from inactive tuberculosis.
4. The titer is of no significance as to diagnosis, nor as to activity.
5. The test may be of diagnostic aid in: a) Tuberculosis in anergic individuals; b) Pleural effusion, especially study of pleural fluid; c) Excluding tuberculosis through a negative test.
6. The test offers the clinician a view into the immunologic response of the patient, information no other way possible.
7. The test is merely another laboratory test, and the use as such may be helpful, if one considers its shortcomings.
8. With a better and more specific antigen, the test may become more specific, with fewer false positive reactions, and more diagnostic.
9. The test is the best laboratory test available to study the serologic response in tuberculosis.

Acknowledgment: The author expresses his gratitude to CDR Gino Szakacs MC USN, Chief of Pathology, and to LT Phyllis Warren MSC USN, Head of Serology Branch, of the U.S. Naval Hospital, St.

Albans, New York, without whose aid and support this study could not have been accomplished.

(The references may be seen in the original article.)

ANNOUNCEMENT

INDUSTRIAL ENVIRONMENTAL HEALTH WORKSHOP

An Industrial Environmental Health Workshop will be conducted by the Naval Ordnance Systems Command Environmental Health Center, Naval Ammunition Depot, Crane, Indiana, in cooperation with the Bureau of Medicine and Surgery. Sessions will be conducted at the Olympic Hotel, Ellis and Eddy at Taylor Streets, San Francisco, California, 94102. All Navy physicians and nurses, civilian or military, are invited to attend. The session for physicians will be held 13-14 February 1967. The session for nurses will be held 16-17 February 1967. Pertinent practical problems encountered daily in every naval industrial medical program will be presented and discussed. Among the lecturers will be the Medical Directors of the Bureau of Employees' Compensation and the Civil Service Commission;

Directors of the Divisions of Occupational Health, and Radiation and Submarine Medicine in the Bureau of Medicine and Surgery; Chief of Occupational Health Nursing in the Division of Occupational Health, U. S. Public Health Service; and Navy specialists in industrial medicine and industrial hygiene.

This is an opportunity for orientation and instruction in handling the complex problems confronting the doctor and nurse daily in naval industrial health programs.

For invitation and program announcement, contact LCDR George M. Lawton, MC, USN, Naval Ammunition Depot, Crane, Indiana, 47522. AUTOVON 551-1610 or 812-854-1284.

—Code 73, BuMed.

MEDICAL ABSTRACTS

GASTROSTOMY IN NEONATAL RESPIRATORY FAILURE

P. F. Jones, M. Chir., FRCS FRCSE and D. H. S. Reid MB MRCPE (From the Special Nursery, Aberdeen Maternity Hospital, and the Department of Child Health, University of Aberdeen.) Lancet II(7463): 573-574, September 10, 1966.

This is a report of treatment by long-continued artificial respiration and gastrostomy of five premature infants with severe respiratory failure. Four survived and the authors feel that gastrostomy played an important part in nutrition and survival of each. To avoid moving the patients, the operations were done in the room in which they were being cared for. Local anesthesia, 0.5 percent lignocaine was used and 20 mg of suxamethonium were injected intramuscularly just before the operations were started to arrest straining and consequent tightening of the abdominal wall.

The gastrostomy tubes were left open for four hours postoperatively and 2.5 ml of dextrose per kg of body weight per hour were given for 12 hours. Gastric emptying was checked before each next feeding. After 12 hours, half strength milk was given. Later, quantity and strength were increased and feedings were given every two to three hours. Catheter washing after each feeding is stressed. Gastrostomy tubes were left in place for at least 10 days. All stomata healed promptly.

The authors believe that gastrostomy has completely resolved all feeding problems in newborn infants who require artificial respiration because of respiratory failure and in their hands, no complications have occurred.

ULTRASONIC AORTOGRAPHY

B. B. Goldberg MD, B. J. Ostrum MD, and H. J. Isard MD, (From the Division of Radiology, Albert Einstein Medical Center, Philadelphia.) JAMA 198: 119-124, October 24, 1966.

The authors report their experience with ultrasonic measurement of abdominal aortic aneurysms enthusiastically. They describe their technique which they say is quite simple to perform. Their studies included measuring the aortas of ten patients, considered normal by aortography, by ultrasound and found

that the average measurement of human size utilizing the latter method compared favorably with measurements obtained from angiographic studies. They then measured 10 aneurysms of the abdominal aorta; nine of these had been diagnosed by aortography and the ultrasound measurements were confirmatory. Four of the aneurysms were resected and the ultrasonic measurements of the aortic walls approximated caliper measurements of the surgical specimens. In addition to the measurements of aneurysms, ultrasound was used to determine the level of the aortic occlusions. Advantages of this technique are listed: the apparatus is portable and ill patients can be examined readily at the bedside; with the use of self-developing film, the display of echoes on the oscilloscope can be photographed immediately and a record obtained in a few seconds; the procedure is entirely safe and the discomfort and morbidity associated with catheter and injection techniques are eliminated; repeated examinations cause no problems when serial studies are indicated; the cost is low.

Examinations of blood vessels by this procedure is not limited to the aorta; aneurysms of the iliac, femoral, and popliteal arteries have been recorded.

TRANSDUODENAL PANCREATOGRAPHY: AN IMPROVED TECHNIQUE

J. E. Trapnell MD, J. M. Howard MD, Mrs. Janice Brewster, (From the Department of Surgery, Hahnemann Medical College.) Surgery 60: 1112-1119, Nov 1966.

With proper appreciation of the risk involved and meticulous attention to the technique which they describe, the authors feel that pancreatography can be done with comparative safety without sphincterotomy. This, they state, will pave the way to more selective and rational operations for patients with chronic pancreatitis. Following "excellent" results in four patients whose pancreatic ducts were cannulated transduodenally without sphincterotomy, they evaluated their method further by studies in the autopsy room with the following aims: (1) to see how often the pancreatic duct could be entered via the ampulla of Vater by direct cannulation without sphincterotomy, (2) to measure the minimal amount of dye required to visualize the normal pancreatic

duct radiographically, and (3) to define radiographically, the normal anatomy of the pancreatic duct in situ. They acknowledge that pancreatography by direct transpancreatic needle puncture with aspiration and injection into the duct is the simplest approach but, of course, this usually is not possible technically.

Authors technique: (1) A flat plate of the abdomen is taken before the operation is begun to verify the radiographic technique to be followed; (2) a duodenotomy is performed and the ampulla of Vater is identified and gently probed; (3) if the pancreatic duct is entered directly, the probe is withdrawn and a catheter is inserted (16-17 medium "intracath" from an ordinary intravenous set is recommended); (4) if the common duct is entered, the probe is palpated and withdrawn and the ampulla is more closely inspected for a second ostium on its summit; (5) if a second probing also fails, secretin (1.5 units per kilogram of body weight) may be given intravenously (after a precautionary intradermal sensitivity test) to produce a good flow of juice to open the mouth of the duct to aid identification and cannulation; (6) aspiration through the catheter (usually unrewarding but should not be omitted especially if secretin has been given); (7) injection of 0.5 ml of dye (Diatrizoate Sodium [Hypaque 70 percent]) slowly; (8) flat plate x-ray of abdomen; (9) if no reflux of dye has occurred around the catheter, an additional 0.5 ml may be introduced; (10) second x-ray; (11) if developed films show dilatation of the duct and incomplete outlining, more dye can be introduced using same precautions. Particularly emphasized is the size of the catheter—it must be fine enough to fit loosely in the ampulla to allow reflux of the dye to occur around it.

A discussion of criticisms of the studies follows and answers seem to be adequate.

MITRAL VALVOTOMY IN PATIENTS AGED 50 YEARS AND OVER

J. M. Reid MD, R. S. Barclay MD, J. G. Stevenson MD, T. M. Welsh MB, N. McSwan MB, (From the Cardiothoracic Unit, Mearnskirk Hospital, Newton Mearns, Glasgow.) Brit Med J 2: 1044-1046, October 29, 1966.

The authors pose the question: "Is mitral valvotomy justifiable in patients over the age of fifty?" In exploring this, they report their experience with 99 patients aged 50 and over who underwent mitral valvotomy. They feel that their results would support the contention that operation is certainly both worthwhile and rewarding in this group, accepting

that mortality is higher owing to accompanying degenerative heart and cardiovascular disease.

In this series, the immediate mortality was 14 percent. Eleven more died during the period of follow-up which varied from six months to nine years. Most of the survivors benefited from the operation and have maintained their improvement even when slight mitral incompetence has been produced. Mortality and morbidity in this age group are increased because of the incidence of chronic bronchitis with emphysema, severe pulmonary arterial hypertension, valve calcification, and renal damage. Careful supervision in the immediate post-operative period is stressed.

COEXISTING BRONCHOGENIC CARCINOMA AND TUBERCULOSIS

J. Shah-Mirany MD, A. F. Reimann MD, and W. E. Adams MD, (From the Department of Surgery, The Suburban Cook County Tuberculosis Sanitarium, Hinsdale, Illinois, and the Department of Surgery, The University of Chicago.) Dis Chest 50: 258-264, Sept 1966.

Following a short historical review of attempts, in the past, to relate bronchogenic carcinoma and tuberculosis etiologically, the authors present a study of 95 patients with pulmonary carcinoma who were admitted to a tuberculosis sanitarium. All had positive tuberculin skin tests and most had sputum positive for acid-fast organisms or chest x-rays with changes suggestive of tuberculosis. Fifty-four had active or chronic inactive pulmonary tuberculosis and forty-one had only a positive tuberculin skin test as evidence of previous tuberculosis. After careful study, they conclude that the type of carcinoma seen in patients with tuberculosis appears to have the same distribution as in patients reported to have bronchogenic carcinoma not affected by tuberculosis; that chronic inactive pulmonary tuberculosis was seen more frequently in patients with squamous cell carcinoma while active tuberculosis was more often associated with adenocarcinoma and undifferentiated carcinoma; that the absence of early lymph node metastasis suggests that tuberculosis may impede the spread of carcinoma. It was not possible, in this series, to relate the origin of carcinoma to the exact area of pulmonary tuberculosis. Errors in diagnosis due to cavity carcinoma and negative sputum cultures showing scotochromogen organisms were responsible for delays in treatment.

The authors feel that early diagnosis and early resection appear to offer the best chances for cure,

that the combination of the two is not hopeless by any means, and they urge an aggressive attitude.

ANAL CARRIAGE AS THE PROBABLE SOURCE OF A STREPTOCOCCAL EPIDEMIC

W. M. McKee MD, J. M. Di Caprio MD, C. E. Roberts, Jr. MD, and J. C. Sherris MD, (From the Departments of Medicine and Microbiology, University of Washington School of Medicine and the Clinical Microbiology Laboratories, University Hospital, Seattle, Washington.) *Lancet* II: 1007-1009, November 5, 1966.

Anal carriage of streptococcus pyogenes in a hospital attendant is reported as a probable source of eleven hospital infections due to this organism over a period of eleven weeks. Epidemiological evidence strongly suggested one individual as the source but multiple cultures of his nose, throat, and skin had been negative. Additional sites were cultured and profuse growth of the epidemic strain was obtained from the anal orifice. Air-sampling studies showed extensive environmental dissemination of the epidemic organism from the carrier. The carrier state was eliminated by parenteral penicillin and oral vancomycin therapy. Two numbers of his family of five had heavy colonization of the anal orifice by strepto-

coccus pyogenes. Findings suggest that a history of anal pruritis may be a clue to the possibility of anal carriage of this organism. The authors stress that an exhaustive history, careful examination for skin lesions, cultures of skin, anal area and the vaginal area besides the nose and throat may be necessary to discover the site of streptococcal carriage.

INCREASING AUTOPSY INCIDENCE OF CORONARY HEART DISEASE IN WOMEN

H. M. Parrish MD, C. A. Carr MSPH, S. L. Silberg MPH PhD, and J. C. Goldner MD, (From the Department of Community Health and Medical Practice, University of Missouri School of Medicine, Columbia, Missouri.) *Arch Intern Med* 118: 436-445, November 1966.

This study reports an increase in the autopsy incidence of coronary heart disease with concomitant diabetes mellitus among white women from 1935 through 1949 to 1950 through 1959 and an increase in women without concomitant diabetes mellitus. The prevalence of coronary atherosclerotic blockage increased with age. Hypertension was associated with an increased prevalence of coronary artery atherosclerotic blockage. No association was found between body weight at time of death and the prevalence of coronary artery atherosclerotic blockage.

DENTAL SECTION

ADVERSE REACTIONS TO PENICILLIN

G. Westerman, A. Corman, P. Stelos, and J. H. Nodine, *JAMA* 198(2): 173-174, October 10, 1966.

The authors present pertinent recent information concerning sensitivity reactions to penicillin, their prevention and their management. Sensitivity reactions to penicillin occur in five to ten percent of patients receiving it, which is an important concern to all medical and dental practitioners. Allergic reactions to penicillin account for approximately ten percent of the reported adverse drug reactions in the United States and are now the most common type of anaphylactic shock. Penicillin is the only available potent bactericidal drug which is relatively innocuous and thus will continue to enjoy broad usage.

Attempts are being made to restrict its usage which is further complicated by increasing sources of unintentional penicillin administration or ingestion, all of which serve as avenues for sensitization.

Parenteral administration causes most sensitization. Allergic reactions are known to occur with all types of penicillin. Involvements of the skin and mucosa include rash and urticaria as examples. Hematologic manifestations include eosinophilia, hemolytic anemia and coagulation defects. Reactions of the vascular and collagen systems include systemic lupus erythematosus, necrotizing angitis and shock. Although transient urticaria, fever and joint pain account for the large proportion of adverse reactions, one must always be cognizant of the more severe and bizarre possibilities. Immediate and accelerated reactions have an incubation time of five seconds to one hour. These reactions may be mild; however, anaphylactic shock can occur. In delayed reactions the incubation time is usually five to fourteen days and should not be confused with "delayed hypersensitivity." The common delayed reaction is delayed urticarial serum sickness, joint pain and purpura. The erythematous-vesicular or id is a delayed reaction beginning with vesicles and bullae of the extremities

and the groin which may progress to generalized skin involvement. Penicillinase is an enzyme which breaks the B-lactam ring and converts the penicillin molecule to penicilloic acid which is nonantibiotic and nonantigenic. Penicillinase is of significant value in decreasing the severity and duration of both immediate and delayed penicillin reactions. Only minor reactions to penicillinase have been reported. Every patient should be carefully questioned regarding any previous adverse reaction to penicillin plus any type of allergic condition he may have had such as hives, asthma, hay fever and eczema. Patients with any of these conditions are more prone to anaphylactic reactions. Most severe reactions occur within a few minutes up to the first hour which obviates careful observation of the patient. Skin-testing procedures are not completely reliable. Restriction of the use of penicillin for specific bacterial infections and for prophylaxis in selected diseases such as rheumatic fever is encouraged to prevent sensitization and reactions. Immediate therapy is essential for immediate and accelerated reactions in the following order: (1) Tourniquet, to prevent more systemic absorption of penicillin remaining in the depot site; (2) Epinephrine, 0.3 to 1 ml of 1:1,000 solution subcutaneous or intramuscular and repeat if necessary, providing the patient's physical condition will allow it; (3) Hydrocortisone, 100 mg intravenously following epinephrine; (4) Antihistamine, chlorpheniramine, maleate, 5 to 10 mg, subcutaneous or intramuscular; (5) Penicillinase, 800,000 units intravenously followed by an equal amount intramuscularly; (6) Aminophylline, where bronchospasm or respiratory symptoms predominate, 250 to 500 mg is given slowly intravenously.

The abstractor adds that dental personnel involved in the treatment of immediate and accelerated reactions should immediately seek assistance from the medical officer following steps (1) and (2) of emergency treatment. Where respiratory difficulty is

prominent, an adequate airway must be maintained through the use of tracheotomy, if necessary. Treatment of delayed reactions tend to vary less in their character and to be more commonly associated with the skin and joints. The therapeutic drugs in similar dosages as indicated for accelerated reactions are as follows: (1) epinephrine, (2) antihistamines, (3) penicillinase, and (4) corticosteroids.

AN ALTERED CAST PROCEDURE TO IMPROVE TISSUE SUPPORT FOR REMOVABLE PARTIAL DENTURES

R. J. Leupold and F. J. Kratochvil, J Prost Dent
15(4): 671-678, July-August 1965.

Stable distal extension removable partial dentures, which are the result of improved tissue support with a minimum of postinsertion adjustments, can be produced by altering the edentulous part of the cast on which the casting was fabricated using complete denture principles of impression making. The fabricated metal framework is fitted in the mouth; a layer of wax, as a spacer is placed between the metal framework and the cast, and autopolymerizing resin is adapted in the edentulous areas. The margins are muscle trimmed with compound, and the impression is completed with a ZnO-eugenol impression. Edentulous parts of the original master cast are removed with a fret saw; grooves for retention are drilled in the cut surfaces and the framework, with the final impression attached with wax. The new impression is boxed and cast in artificial stone. The increased stability of the underlying base in turn improves the support of the occlusal relationship of the denture to the opposing teeth, thus reducing unfavorable stresses on the abutment teeth.

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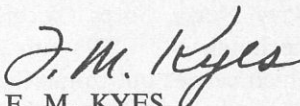
PERSONNEL AND PROFESSIONAL NOTES

HOLIDAY SEASONS GREETINGS

The time has again arrived when we think of the holiday tradition of family reunions, religious associations, thankfulness for our way of life, and, possibly, a few days of camaraderie and relaxation.

In our holiday devotions let us include sincere expressions of gratitude to the members of our professional family who are overseas and defending the concepts of freedom. May we also extend a friendly hand to brighten the Christmas of their families.

Merry Christmas to all of you and my warmest and most sincere wishes for health and happiness during the New Year.


F. M. KYLES
Rear Admiral, DC, USN

RADM SIMPSON HONORARY BOARD MEMBER SAN DIEGO DENTAL SEMINAR



RADM M. E. SIMPSON, DC, USN

The appointment of RADM M. E. Simpson DC USN as the first honorary board member of the San Diego Dental Seminar was announced by Dr. L. Shelby Smith, president of the 110-member study

group. RADM Simpson, who serves as Director of Dental Activities in the 11th Naval District, assumed his present position following two years as senior dental officer at the San Francisco Naval Shipyard. In announcing RADM Simpson's appointment, Dr. Smith said the honorary board membership was created in keeping with the intense interest displayed by Navy dentists and interns in the Dental Seminar.

FORMER DENTAL CORPS OFFICER APPOINTED DEAN

Dr. Edmund E. Jeansonne of New Orleans will serve as the first dean of the Louisiana State University School of Dentistry, now being developed within the LSU Medical Center at New Orleans. Dr. Jeansonne has served as dean of the School of Dentistry of Loyola University of the South since 1964. He is a native of New Orleans and a graduate of Loyola, earning his Doctor of Dental Surgery degree in 1938.

Dr. Jeansonne is a retired U.S. Navy Captain, having served from 1938 to 1960 in various teaching and administrative capacities throughout the Naval Dental Corps, including the Naval Dental School, Bethesda, Maryland; Mayo Foundation Clinic, Rochester, Minn.; and the Georgetown University Dental School, Washington, D.C.

NURSE CORPS SECTION

NAVAL MEDICAL RESEARCH INSTITUTE ESTABLISHES A NURSING RESEARCH DIVISION

The Naval Medical Research Institute has established a Nursing Research Division as part of the Department of Behavioral Sciences. The purpose is to conduct critical, systematic, and formal inquiry, or investigation, into nursing in order to obtain facts and discover principles that will lead to the improvement of education and practice for the welfare of the patient. The objective of the Division is the development of a scientific body of knowledge that will contribute to the scientific assessment and the evaluation of nursing practice.

The Division is organized, under the direction of a Navy Nurse Corps officer, CDR Ouida Catherine Upchurch NC USN, into an administrative branch, which carries out primarily support functions, and a project branch. Within the project branch are teams, each one of which is assigned to investigate a specific

problem area. Each project team, led by a chief investigator who is prepared educationally at the doctoral level, is made up of five to ten members. Team members may be nurses, psychologists, sociologists, statisticians or representatives of other professions depending upon the specific area being studied.

During the first year of operation, seven research projects were submitted and approved for implementation; three of these are scheduled to commence during this fiscal year. These three projects include the development of a technical specialty for Hospital Corps personnel in nursing and ward management; the modernization of the curriculum of basic Hospital Corps School; and the development of a design for in-service nursing education and training in naval hospitals and dispensaries.

The remaining four projects, scheduled for future



CDR OUIDA CATHERINE UPCHURCH NC USN

Head, Nursing Research Division, Department of Behavioral Sciences.

implementation, include the development of a training program for public health nursing specialists in the outpatient department, a study of the training and utilization of Hospital Corps personnel; the development of scientific procedures and modern routines for providing nursing care; and the development of criteria and dimensions for evaluating excellence in nursing care.

At this time tentative plans are being developed for exploratory and advanced development of addi-

tional projects in clinical nursing. Some of these are being planned through the collaborative efforts of physicians and nurses.

The Division has announced the following recent additions to the scientific staff:

Dr. Dagmar Brodt (R.N., Mounds-Midway School of Nursing, St. Paul, Minnesota; B.S.N.E., University of Minnesota; M.S.N.E., Ph.D., St. Louis University) has been appointed chief investigator for a project to develop a technical specialty for Navy Hospital Corps personnel in nursing and ward management. Dr. Brodt's prior position was that of Research Coordinator and Associate Project Director of the Service Manager System Research Project, Barnes Hospital, St. Louis, Missouri.

LCDR Phyllis J. Elsass NC USN (R.N., Aultman Hospital School of Nursing, Canton, Ohio; B.S., M.S., University of Colorado) has been appointed assistant head, Nursing Research Division. During her Navy career, Miss Elsass has served as a head nurse and nursing supervisor in naval hospitals in the continental United States, Guam and Japan.

Dr. Alice Lorraine Wallenborn (R.N., Evanston Hospital School of Nursing, Illinois; B.S., University of Virginia; A.B., Catawaba College, Salisbury, North Carolina; A.M., M.D., Columbia University) has been appointed chief investigator for a project to develop a modernized curriculum for the Basic Hospital Corps School. Prior to this appointment, Dr. Wallenborn was chairman of the graduate program, Syracuse University School of Nursing.—Public Affairs Office, NNMC, Bethesda, Md.

AEROSPACE MEDICINE SECTION

A SHORT REVIEW OF ANTHROPOMETRICS AND NAVAL AVIATION

CDR C. L. Ewing MC USN, NAMI.

In 1950, the U.S. Air Force conducted an anthropometric survey of over 4,000 individuals on active duty. This represented the largest survey ever performed on the male population of the United States and one of the finest ever performed anywhere. The results were published in WADC Technical Report 52-321 and were carefully analyzed by the leading experts in the United States. A great many useful applications resulted from the survey, including tariffs for flight clothing, three dimensional head

forms to be used in designing oxygen masks and helmets, and military size specifications for all new military aircraft.

In 1961, CAPT W. L. Jones, MC USN and Mr. Edmond Gifford made a preliminary survey of the U.S. Navy pilot population, using similar methods to the U.S. Air Force study. They found considerable differences in the percentile distributions of sitting heights between the U.S. Navy and the U.S. Air Force study with the average Navy pilot being con-

siderably taller and thinner than the U.S. Air Force average.

On carefully checking the U.S. Air Force data, as contained in WADC Technical Report 52-321, it was discovered that several biasing factors had been operating during the collection of their data, unknown to them at the time. Specifically, a large proportion of the aviator population measured was in the rank of captain and in fighter aircraft. It was determined that during the period in which most of these aviators had entered the U.S. Army Air Force (1943-1944), there had been a height limitation on fighter pilot trainees of 5 feet 10 inches, whereas the Navy had had no such limitation. Also, lumped into the data with the aviators was data from truck drivers, bombardiers, and gunners.

As a result, BuWeps undertook two studies: one to measure aircraft sitting height accommodation for all Navy aircraft and the other to measure a large sample of the U.S. Navy pilot population, anthropometrically.

In measuring the aircraft sitting height accommodation, an adjustable plastic manikin was used. A spacer template corresponding in size and shape to a large APH-5 helmet was placed over the head of the manikin, and a one-inch spacer added above that for the measurement procedure in ejection-seat-equipped aircraft. The additional inch represents the clearance needed for actuation of the ejection curtain over the top of the helmet.

When the seat was adjusted all the way downward, the manikin was placed in the seat, strapped in, and adjusted until the top of the spacer hit the canopy. If it was possible for TTC ejection to occur in the particular aircraft, then a measurement was made of the maximum sitting height allowed when the top of the seat and the top of the helmet strike the canopy simultaneously.

As a result of the aircraft sitting height accommodation measurements, NAEC letter XG-434: ECG: alc; CO4 AE 13-6; (4579) of 28 May 1963 to BuWeps (RAAE), [Enclosure (3) to NAMI letter], recommended that aircraft utilization codes be established and gave the reasoning behind the recommendation. Governing factors in development of the codes were: (1) ease of use; (2) as few categories as possible; (3) exclusion of a minimum number of pilots by the code use; (4) prevention of pilots from flying aircraft which will not accommodate them. Finally, the letter explicitly detailed the codes themselves.

Thereafter BuWeps letter RAAE-13/2218: WLJ of 10 December 1963 to Chief, BuPers and CMC, via BuMed [enclosure (4) to NAMI letter], recom-

mended by NAEC, giving details of the code. BuMed favorably endorsed the recommended code and set up MMD changes so that aviators could be measured and coded on first reporting to the Naval Air Training Command.

BuMed Instruction 6110.8 of 21 October 1964 [reference (c) to NAMI letter] detailed new physical standards, the measuring requirements, and the size coding so that codes could be assigned to each aviator as a result of his measurements.

The final link, the implementing instruction by BuPers or OpNav, has *not* been promulgated.

In the U.S. Navy anthropometric survey, 1,659 naval aviators (representing a 10 percent sample) were measured in 1964. The percentile distributions were determined and distributed in ACEL-NAEC-533 [enclosure (5) to NAMI letter], Anthropometry on Naval Aviators, 1964, by Gifford, E. C.; Provost, J. R.; and Lazo, J., dated 8 October 1965. This is the situation at present.

Meanwhile there is some evidence that size disparities between aviator and aircraft not only cause accidents to occur but also injuries during accidents, specifically vertebral fractures.

Lodge (as reported in FS Newsletter 3-63) at NASC found a significantly higher accident rate in jet pilots with a standing height greater than 72 inches than in jet pilots between 69 and 72 inches.

Ewing [enclosure (1) to NAMI letter] at NAMI in 1965 found a significant correlation between disparities in sitting height accommodation in aircraft and vertebral fracture on TTC ejection.

The theory is that any person outside the maximum sitting height accommodation limit will have to alter his sitting position (i.e. must slump) in order to reach the face curtain handle. Slumping, known to be associated with a higher incidence of vertebral fracture or ejection, theoretically causes vertebral pre-loading. Thereafter, a much smaller input of impact energy is required to cause fracture than if the vertebral separation were not only permitted but forcibly maintained during ejection by a suitable minimum seat angle and restraint system.

Factors causing vertebral pre-loading

1. Size disparity between man and aircraft.
2. Utilization of secondary firing handle (forward bending).
3. Through-the-canopy ejection.
4. Negative acceleration at time of ejection.
5. Inverted flight at time of ejection.
6. M-B parachute location.
7. M-B restraint system—*designed by U.S. Navy* causes forward bending.

Factors preventing vertebral pre-loading

- 1. Face curtain ejection actuation.
- 2. Non-TTC ejection.
- 3. NAMC restraint system—pins buttocks and shoulders back.
- 4. Sufficiently great ejection seat angle.

The Naval Air Systems Command has issued a military specification Mil-S-18471 A(WP) of 13 August 1965 entitled "Seat System, Ejectable, Aircraft, General Specification for." WADC TR 52-321 is utilized as the reference for sizes, but BuWeps Drawing 65 A-136H1 is utilized for ejection seat design parameters. Paragraph 3.2.1 of subject specification requires that the design of the ejection seat "shall accommodate 3 through 98 percentile aircrewmen shall be in accordance with WADC TR 52-321 or superseding documents."

Under paragraph 3.3.1.1.1.1.1, "Sufficient clearance shall be provided between the face curtain handle and the canopy to allow for hand insertion and grasping of the face curtain by the 98th per-

centile aircrewman . . . with the seat in the full-up position."

Under paragraph 3.3.6, "The seat angles and ejection envelope reference points shall be in accordance with BuWeps Drawing 65A136H1.

The net result of this new milspec for ejection seats is that the seats must be designed to accommodate the 3 through 98 percentile crewmember, that one measure of such accommodation is that the 98 percentile man must be able to insert his hand between head and canopy and grasp the face curtain with the seat in the full-up position, and that the seat angle is fixed by BuWeps drawing rather than being left to chance.

Thus, the problem of size disparity between man and aircraft is only of importance in aircraft now in inventory, provided that new purchases comply with the noted milspec.

As specifically applied to ejection seat equipped aircraft of the Naval Air Training Command, the following facts are noted:

A/C Type	Seat Type	Seat Location	MSHA * (inches)	Pilot ** Percentile	'59-'63 Gross Ex Rate
TF-9J	M-B	FC	36.3	55	34%
	M-B	RC	38.0	95	36%
T-2A	Rocket	FC	38.1	90	22.2%
	Rocket	RC	38.1	90	0
F-11A	STD	—	37.5	85	12.5%
TA-4E	RAPEC	FC	ca 43	99	X
	RAPEC	RC	ca 43	99	X

* ACEL, unpublished
** U.S. Navy Anthropometry 1964

EMERGENCY UNDERWATER ESCAPE FROM AIRCRAFT

CDR C. L. Ewing MC USN, NAMI.

In naval air operations water crashes and ditchings constitute a relatively high proportion of all major aircraft accidents at sea. Experiments (i.e., with engine shutdown and simply dropped from flight deck height rather than having any greater velocity) have shown that jet aircraft float for a maximum of 60 seconds and then descend at a rate of several hundred feet per minute. Escape above water may not be possible.

Escape from a ditched aircraft may be accomplished as it sinks, after it sinks, or the pilot might be unable to escape, and have his aircraft come to rest on the bottom in relatively shallow water. Some considerable time may elapse before rescuers can obtain SCUBA gear, locate the aircraft and effect the rescue. During this period the aviator can continue to breathe 100 percent oxygen from the aircraft converter even though submerged. It must be clearly

understood that use of oxygen-breathing capabilities in the crash situation is no substitute for escape attempts, but only a means of prolonging life while escape and/or rescue can be accomplished.

Oxygen Supply Under Water

The nominal oxygen equipment installed in first-line jet aircraft, consisting of Lox converter, minireg, A-13A mask, emergency bailout oxygen bottle, will continue to supply 100 percent oxygen even while submerged. The supply pressure will be equal to that exerted by the water at the regulator. Thus the nominal oxygen system constitutes SCUBA equipment. Since the minireg is mounted at an optimal position, breathing is possible whether the aircraft is upright or inverted, nose up or nose down, or lying on its side. Since the regulator is supplying oxygen at the ambient water pressure, there is no pressure differential and no great inspiratory pressures are required.

The time duration for underwater breathing will naturally vary with the oxygen supply available at the time of the accident, the development of oxygen toxicity, the depth, and the amount of exertion of the aviator. The first two factors noted are the most important. If the accident occurred with a full converter, the 10 liter converter is capable of 109 minutes of operation at 20 liters per minute average flow at a 100 foot depth. Therefore the true limiting factor on duration of underwater breathing is the time required to develop oxygen toxicity.

Two problems may be encountered in such underwater utilization of the aircraft oxygen system while awaiting rescue. One is that buildup of ice on the warming coils may lower their thermal conductivity and result in lowering the breathing oxygen temperatures. The other is that water may freeze on exposed valve seats or bellows, thus interfering with valve operation. Since the aviator can do nothing about either problem, these factors are of academic interest only.

When the aviator escapes from the aircraft or is rescued, he can disconnect himself from the aircraft oxygen converter and continue breathing uninterruptedly and easily from the bailout bottle and minireg during ascent to the surface.

The same thing is true of underwater breathing in the full pressure suit. Since the helmet-mounted regulator is providing oxygen at the same pressure as the surrounding water, the only differential pressure across the visor would be the 1" water pressure differential normally exerted to prevent suit leakage into the breathing compartment. Specifically, breath-

ing at simulated depths of 100 feet has been accomplished without difficulty.

Moreover, the full pressure suit itself is a reservoir of oxygen, in addition to the bailout bottle and aircraft Lox converter. If neither of the latter is available, or if both become exhausted, the aviator may, as a last resort, breathe from the body compartment of the suit by "slipping" the face seal. Tests at ACEL have shown that breathing can be continued in this way in the upright position for about 10 minutes, in the side position for about 6 minutes, but only a minute or so in the inverted position. These tests were performed at a depth of only 11 feet, however.

In the single case of breathing from the suit, the major limiting factor on duration is carbon dioxide buildup with consequent hyperventilation. This is expected, of course, since rebreathing from the suit was not a design feature.

When the diluter-demand regulator is being utilized the 100 percent oxygen setting must be selected and the mask must be tightly adjusted to the face. For this reason, aviators using diluter-demand regulators should select 100 percent oxygen for all landings and takeoffs, since the system will work as well in mud or swamp as it does in seawater.

Regulator Location and Oxygen Supply Pressure

Work performed at the Navy's Aerospace Crew Equipment Laboratory has shown that one major factor in underwater breathing from aircraft oxygen supplies is the location of the regulator itself, since the pressure sensing device which determines the pressure with which the oxygen is supplied is contained therein. It was found that if the regulator were mounted six inches below the suprasternal notch, the pressure on the lungs would be excessive. If the subject with the regulator mounted at the same position became inverted, the oxygen supply pressure would be so low that water would be inhaled. These experimental findings account in part for the location of the FPS regulator on the helmet at the level of the mouth, and for the minireg on the A-13A (at about the level of the suprasternal notch). A one-foot depth separation in water will result in approximately 0.5 psi differential pressure.

The regulator's position ideally should be on the line from axilla to axilla. Console-mounted regulators, usually of the diluter-demand type, are invariably below this level, thus causing the oxygen pressure to be positive. When breathing underwater

from them, the body should be bent toward the regulator so as to have the chest and the regulator at the same level, thus minimizing differential pressure.

Physiological Problems

1. On the Bottom

Residence underwater presents several potentially hazardous problems:

- a. CO₂ intoxication
- b. N₂ intoxication
- c. O₂ intoxication

Actually, all metabolic carbon dioxide is exhausted via the exhalation valve and, therefore, carbon dioxide intoxication presents no problem. Since 100 percent oxygen is the only inspired gas, nitrogen is being washed out constantly, and, therefore, nitrogen intoxication is not a problem either. However, oxygen intoxication is very definitely a problem and the other limiting factor on underwater breathing of 100 percent oxygen from the Lox converter and minireg.

Table 1-19 from the Navy Diving Manual shows the safe durations at the noted depths while breathing 100 percent oxygen. This information gives rescuers of an aviator trapped in his aircraft in shallow water some idea of the time frame within which they must work. Emergency limits are noted in Table 1-33. When the time limits noted are exceeded, only convulsions can be expected, not death. However, death from drowning during the convulsion must be anticipated and prevented, and rescuers should realize that convulsions if they occur, are probably due to oxygen toxicity rather than injury or other cause. It should be clearly understood that the noted time limits apply only to the aviator (or anyone else) breathing 100 percent oxygen, since rescue divers probably would be breathing air. If, however, the rescuers are using 100 percent oxygen apparatus, it applies to them also.

If these time limits are exceeded, figure 1-33 presents the results of experimental exposures to pure oxygen at various depths for various times, thus allowing estimation of the probabilities of development of oxygen toxicity. The proximity of possible warning symptoms and even convulsions to the Important Operation Limit Curve is apparent. Less apparent is the contrast between the perfect conditions that existed during these exposures and the conditions that would probably exist in the field. The experiments were conducted in a pressure tank. The work rates were moderate and uniform. The

Table 1-19

OXYGEN DEPTH-TIME LIMITS	
(Depth and time limits of exposure when breathing pure oxygen during working dives.)	
1. NORMAL OXYGEN LIMITS	
Depth (feet)	Time (minutes)
10	240
15	150
20	110
25	75
2. LIMITS FOR EXCEPTIONAL OPERATIONS	
Depth (feet)	Time (minutes)
30	45
35	25
40	10
3. EMERGENCY LIMITS	

From: U. S. Navy Diving Manual NAVSHIPS 250-538 of July 1963, Chap 1. 5. 7.

inspired gas was free of carbon dioxide. Two tenders were standing by each subject. It is likely that exposure to oxygen at these depths for the same times under operating conditions following a crash would produce a much larger proportion of unfavorable effects.

To delay the onset of oxygen toxicity, the aviator should remain perfectly still during rescue operations after the rescuers are made positively sure he is alive.

2. During Ascent

The major problem during ascent is due to intrapulmonary gas expansion. If an individual ascends to the surface from 100 feet (or 4 atmospheres), the gas within his lungs will expand to four times its original volume. If not allowed to escape, it will rupture the alveoli and thus cause aeroembolism to the left heart and thence through the aorta. Such emboli can be highly variable in effects since the consequences depend upon the area or organ

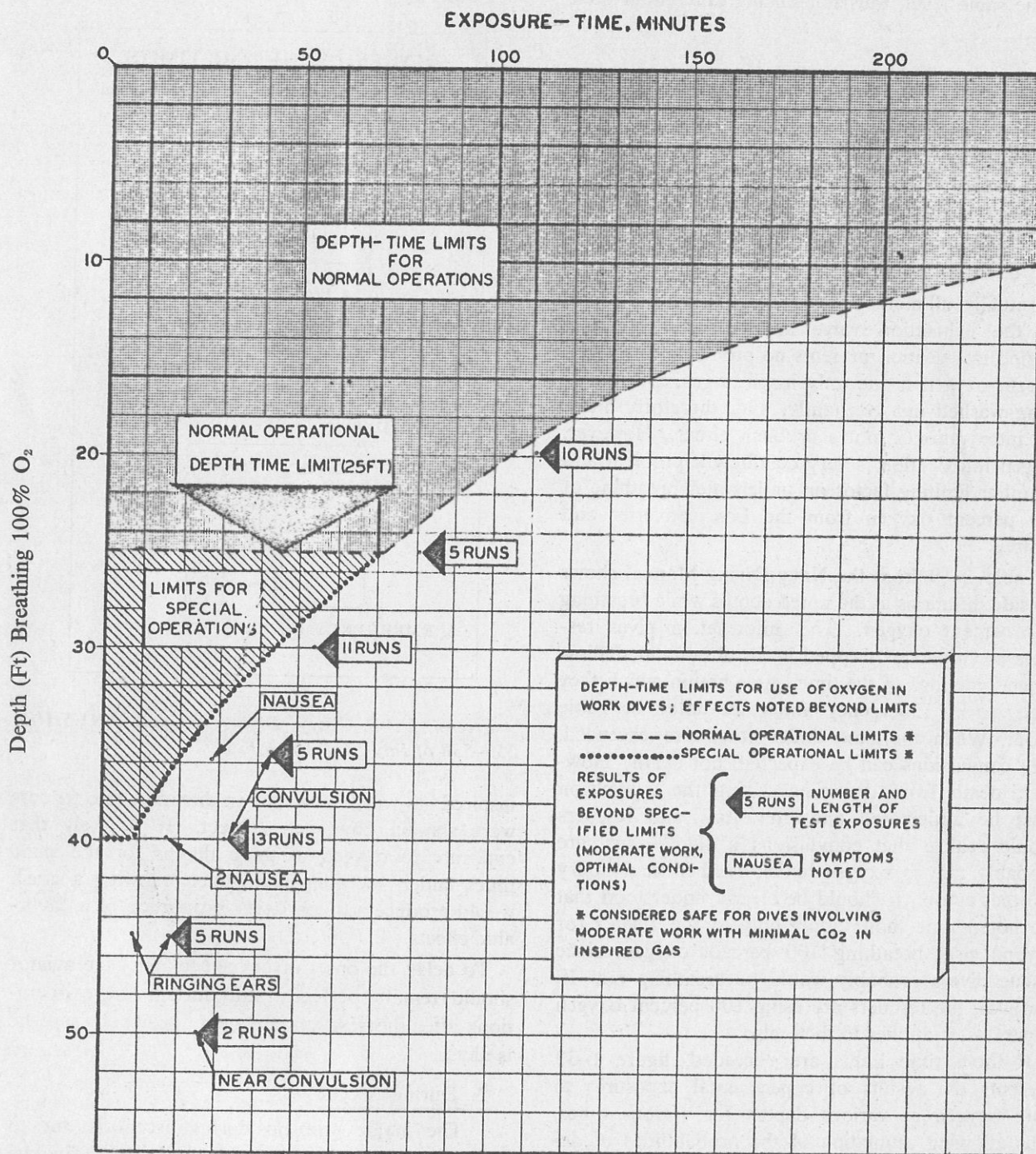


FIGURE 1-33.—Oxygen depth-time limits.

From: U. S. Navy Diving Manual NAVSHIPS 250-538 of July 1963, Chap 1. 5. 7.

where the emboli eventually block the arteries, but are frequently fatal.

Fright can, apparently, cause laryngeal spasm thus sealing the lungs during ascent. Under these circumstances, death due to aeroembolism has occurred in ascent from depths of only 15 feet. At least one such case has followed ascent from the bottom of a swimming pool, as reported in the Navy Diving Manual.

On the other hand, safe ascents can be made from depths of more than 100 feet without any breathing appliance, provided that the individual exhales continuously during his ascent. This is called the "Blow-and-Go" method of ascent and is the one to be utilized by aviators when escaping from aircraft underwater, where no bailout oxygen is available. As noted earlier, continuous respiration utilizing the bailout oxygen bottle on ascent also will equalize pressure and prevent gas expansion damage to the lungs.

Underwater Ejection

Most NATOPS procedures call for canopy jettison when a ditching or water crash is imminent. If the canopy is successfully removed prior to water impact, escape is not too complicated. However, in many instances, the canopy jettison mechanism is designed to lift the leading edge of the canopy sufficiently that normal windblast will complete the job of removal. In the slow velocity water crash, typified by the "cold" catapult shot, windblast may not be sufficient to complete the canopy removal

sequence. In other cases there is simply no time available to jettison the canopy. Also, underwater canopy jettison is usually unsatisfactory. If the canopy cannot be removed, and if through-the-canopy (TTC) ejection is possible in the particular aircraft type, it may be attempted as a "last ditch" method of escape, especially in an aircraft rapidly descending in deep water.

Water drag on the head and neck, as well as possible impact of the head on the canopy may cause severe or even fatal head and neck injury. To lessen the risk, the seat must be fired with the face curtain over the head, thus lessening the water drag on the head. The usual mechanism of injury is flexion of the head and neck resulting in cervical vertebral fracture and possible spinal cord compression.

Having pointed out the severe hazards, it can now be stated that successful underwater ejection is possible and has been accomplished with no injury on one or more occasions. ACSEB 34-61 (seal MBEU 18605) must be incorporated to assure watertight integrity of the Martin-Baker gun system, thus permitting underwater firing. Again, it must be emphasized that underwater ejection is a hazardous undertaking which should be used only if no other means of escape is possible.

The comments concerning underwater ejection may or may not apply to rocket-type seats since these have not been adequately tested. Any such use of a rocket seat should be considered extremely hazardous at least until testing has been accomplished.

AVIATION PHYSIOLOGY TRAINING BUILDING DEDICATED NAVAL AIR STATION, MIRAMAR, CALIFORNIA

Approximately 100 guests representing the U.S. Navy, U.S. Air Force, and the civilian aerospace industry attended the Dedication Ceremony and Open House of the new Aviation Physiology Training Building at the Naval Air Station, Miramar, California on 27 September 1966.

The principal speaker was VADM T. F. Connolly USN, Commander, Naval Air Force Pacific Fleet, CAPT W. W. Jones USN, Commanding Officer, "ejected" through a huge blue ribbon on an ejection seat training tower to mark the official opening of the new facility.

The new training building is a one-story concrete structure containing a rapid decompression chamber capable of simulating altitudes up to 100,000 feet, classrooms, full pressure suit fitting rooms, night vision trainers, flight simulators, administrative offices, storage spaces, and a physical examination and treatment room. Outside the building are ejection seat trainers and a water survival training tank.

With the advent of newer, high performance jet aircraft, physiological training has become increasingly important. This new facility will provide Medical Department personnel with a means of in-



VADM T. F. Connolly USN, Commander Naval Air Force, Pacific Fleet, is shown dedicating the Aviation Physiology Training Building at the Naval Air Station, Miramar, California.

creasing the proficiency and training of Naval Aviators, Naval Flight Officers, and Aircrewmembers, thereby improving Fleet readiness and the safety of flight.

BOARD CERTIFICATIONS

The following Naval Flight Surgeons have been certified as Diplomates of the American Board of Preventive Medicine in Aerospace Medicine after successfully passing the examination given during the 1966 meeting of the Aerospace Medical Association:

CAPT Neal D. Sanborn MC USN
U.S. Naval Air Station
Atsugi, Japan

CDR Joseph H. Britton MC USN
USS INDEPENDENCE (CVA-62)
FPO New York 09501

LCDR Warren W. Hodge MC USN
USS SHANGRI-LA (CVA-38)
FPO New York 09501

EDITOR'S SECTION

VILLAGE SICK CALL

Saigon, Republic of Vietnam—"They get closer and closer all the time," the Seabee hospital corpsman said. "Pretty soon they're right on top of you while you're trying to clean or dress a wound. It seems they've just got to see what's going on."

Thus began another sick call in the village of

Nam-O, Republic of Vietnam, for LT Harvey M. Henry MC USNR, and four of his hospital corpsmen. All of them are serving with U.S. Naval Mobile Construction Battalion NINE, based at the sandy Red Beach area near Da Nang.

Dr. Henry is on his second Vietnam deployment

with NMCB-9, arriving in early August for this one. He has been with NINE for 13 months and is due for discharge when the battalion returns to the States.

"I'd sort of like to be discharged here and go home by way of India, the Mid-East and Europe," the 31-year-old Philadelphian explained as the parade of patients began entering.

"I've got approval to enter brain-surgery study at Philadelphia Episcopal Hospital next year," the doctor continued in between spurts of his fair knowledge of the Vietnamese language.

About this time hospital corpsman second class Eugene F. Doss of Lynwood, Calif., began chasing the Vietnamese children out of the already cramped spaces of the 15x30-foot makeshift dispensary.

All five Seabee medical men were treating patients or speaking to the pretty Vietnamese interpreter, who would explain to those already treated when to take their pills or come back for more treatment.

"Sure as anything, they'll trade the pills when they get outside," remarked Abraham B. Greco, hospital corpsman first class from Nueva Eeija, in the Philippines. "I know a lot of them aren't really sick but they've got to have those pills."

Craig W. Peterman, seaman apprentice from Lebanon, Ind., and David J. Hons, seaman apprentice from Aliquippa, Pa., were sharing a bench with a Vietnamese girl. All three were working over patients. They are trying to teach her a few fundamentals in treating wounds.

"You see, the Marines have control of civic action in this area, but all of us cooperate here at Nam-O," said Hons. "I guess though that we are probably here as much as anyone else, and I know Dr. Henry is here more than any other medical doctor."

"The Marines are going to send our nurse's aide here to nursing school," added Peterman. "She'll get her chow, a place to live and pay while she's in training. She's a pretty good nurse right now."

Then a man brought his son in with a dirty rag tied around his lower right arm. After a talk with the father, Miss Kim, the interpreter, explained that the boy, Do La, had been riding a water buffalo when he was thrown off into a barbed-wire fence, ripping a ten-inch gash in his arm.

Do La is a nine-year-old from the hamlet of Xuan Thieu, one of five hamlets which make up the village of Nam-O. Although he was in a slight state of shock, Do La was still taking it very well, shedding no tears, and just a bit bewildered by the activity around him.

Dr. Henry quickly sent one of the corpsmen back to camp to get some special instruments and began



Dr. Henry puts the stitches in little Do La's arm on a makeshift operating table.—Official U.S. Navy photograph.

preparing the boy for the necessary sutures. The only time Do La really whimpered was after he had been put on a small table and Dr. Henry injected the anesthetic. Afterwards he kept very still.

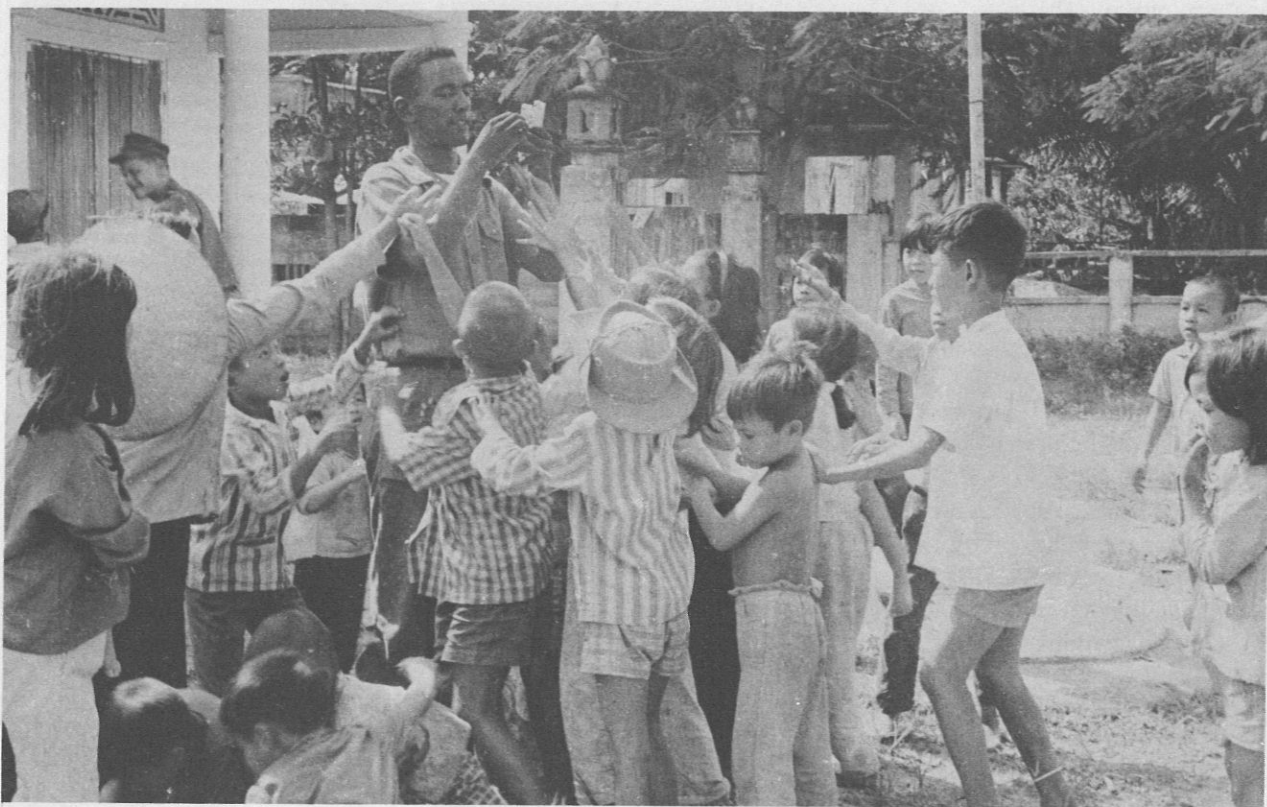
Flies buzzed around Dr. Henry's head as he worked over the boy, and children had to be kept away from the window because they were blocking the light. As the boy's father held Do La's head, the corpsmen took turns holding his arm and hand, making sure he didn't squirm while the sutures were being placed.

Soon, Do La had 15 stitches, a bandaged arm and a stick of chewing gum for being "a number one" patient. He was up and once more staring curiously as the Seabee corpsmen and doctor continued to work on the dwindling line of patients.

As the sun sank lower, sick call was over and Dr. Henry was mobbed as he passed out candy and gum to the reaching, grabbing children.

The Seabee medical team climbed back into the ambulance and headed back to camp. They took one patient with them to remove a large dermoid cyst on his upper neck and dropped off Do La and his father at their hamlet.

They left Nam-O the same way they entered—amid the shrill shouts of "Seabees number one!"—Don Ladd JO3, USN, 3rd NCB Rel #10-66, cleared for release by MACV OI.



The end of sick call finds Dr. Henry being mobbed by eager children as he passes out candy and chewing gum.—Official U.S. Navy Photograph.

SEABEES GET WHEEL CHAIR FOR PARALYZED MONK

Saigon, Republic of Vietnam—The young Vietnamese looked up from his book and his face broke into a broad grin as Navy hospital corpsman second class Jerry L. Rowe, of Carpinteria, Calif., pushed the newly-acquired wheel chair through the door to the small room.

For over three years, Brother Benedict, a 25-year-old Trappist Monk at Chau Son Monastery, near Dran, has been bed-ridden in that room—a victim of an accident which severed his spinal cord. He has been paralyzed ever since, unable to move his legs or his left arm.

Unable to sit up, he is turned in bed every so often by his sister, who has received special permission from the area Abbot to live on the Monastery grounds to care for her brother.

Rowe is the hospital corpsman for Seabee Team 1008, a 13-man detachment from U.S. Naval Mobile Construction Battalion TEN. They are in the area in support of the U.S. Agency for International Development (AID) program.

Rowe first heard about Brother Benedict while he

was bulldozing an area to be used as a volleyball court at the Monastery (all team members are trained in skills other than their own specialties).

The Seabees have been trading mutual aid with the Monks at Chau Son (30 miles from Dalat) since arriving in Da Nhim Valley. The Seabees need the well-equipped wood working shop to make furniture for schools and hospitals in the mountainous resort area. They are also in need of fresh vegetables and meat.

The Monks need mechanical help to keep their old trucks running. Their access road constantly needs maintenance. The brothers also wanted to learn certain skills, such as welding, to finish a large new main building at the Monastery, about four miles from the Seabee camp.

So, by sharing skills and equipment, the Monks and the Seabees improved not only their technical ability, but a bond of friendship tightened between the two alien groups.

The Monks have given the Seabees two young bulls, one of which was butchered. The other has become such a pet of the men they haven't the heart to repeat the process on him. The Monks have also

tried to beautify the Seabee camp area by planting flowers and shrubbery.

Jerry Rowe was intrigued by the story which unfolded about Brother Benedict (his Vietnamese name is Nguyen Qui). He learned that the injured man was given up for dead by Saigon doctors where he was rushed after the accident.

The Monks and Benedict's sister, however, refused to give up, and returned with him to Chau Son. His broken arm was never set, so he lost control over it. His legs are completely useless, and unless strapped down, tend to draw up completely next to his frail body.

Benedict has not only survived, but smiles and laughter come easily to him and his eyes constantly twinkle as he and Rowe banter back and forth with their jokes at each other.

This may be a result of the Monk's degree in philosophy. A constant reader, he also speaks French, English and Chinese fluently. It was Benedict's interest in reading which caused Rowe to try to improve the Monk's reading position. If he could sit up to read it would be more comfortable.

However, the injury to Benedict had left a very delicate area at the base of his spine. If Benedict were to sit up, his weight would be on his back and legs. Original attempts at a conventionally folding hospital bed failed.

Then one of the Team's builders, Jim Chrisp from Cushing, Okla., came up with a hammock-like assembly which he mounted onto a special bed frame. The bed was carefully measured to fit the room size so it could be moved around with ease to give Benedict a view from the window if he desired.

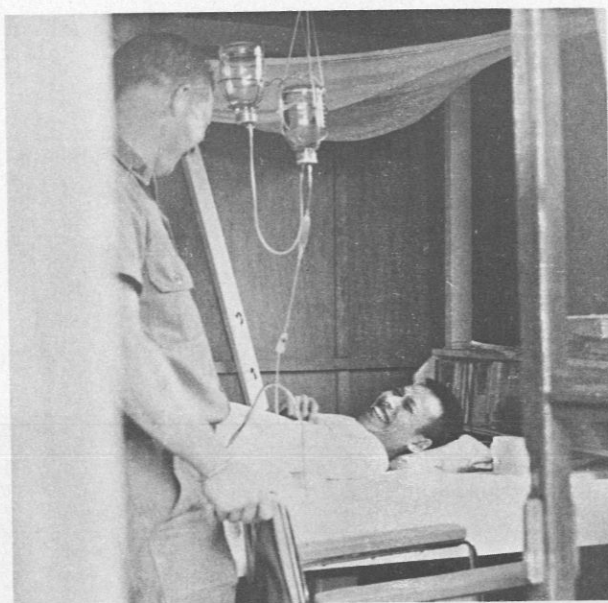
Jerry Rowe, who by this time had become close friends with Brother Benedict, still wasn't satisfied with the situation. He sent a request to the assistant training officer at the Construction Battalion Center, Port Hueneme, Calif., requesting a used wheel chair.

The generosity of the American people was evident when an advertisement was placed in newspapers. It resulted in not only a brand new wheel chair, but a total of 25, from used to new, and offers of more.

The wheel chair finally arrived in Saigon and was whisked to Dalat, and taken from there to Dran. Rowe was completely surprised that the chair was new and quickly began planning with Chrisp to modify it for Brother Benedict's special needs.

Although the final work still has to be completed, the chair was shown to Benedict and he saw his biggest wish materializing—he wants to teach class again in the Monastery's school for boys.

Next to teaching, Brother Benedict wants to referee



Seabee hospital corpsman second class Jerry L. Rowe and Brother Benedict share a joke during the presentation of the wheel chair.—Official U.S. Navy Photograph by Don Ladd JO3, USN.

from his wheel chair the upcoming volleyball contest between the Seabees and the Monks.

Plans are being made to consult medical specialists about Brother Benedict's case. Who knows what the next step in his progress will be?—Don Ladd JO3, USN, 3rd NCB Rel #9-66, cleared for release by MACV OI.

CHRISTMAS-TIME HAZARDS

"If you buy your child a chemistry set as a Christmas gift, keep it away from his younger brothers and sisters." So says Paul V. Joliet MD, Chief, Division of Accident Prevention, U.S. Public Health Service.

"Although chemistry sets offer older children a chance to experiment and learn, young children are apt to ingest harmful chemicals from them," said Dr. Joliet.

"The reason some 500,000 young children are poisoned each year is because youngsters tend to eat anything they can get their hands on—medicines, plants, household products, and other things that sometimes turn out to be toxic. Close supervision and keeping toxic substances out of children's reach will prevent these poisonings," Dr. Joliet said.

"Also, remember to buy a chemistry set designed for the child's age group to be sure he will be able to follow the instructions. There is always the danger

of mixing the wrong chemicals and starting a fire and explosion," the PHS physician cautioned.

Dr. Joliet also warned of these other Christmas-time hazards to young children:

—Bubbling fluid in Christmas tree lights is methylene chloride, which can be poisonous if inhaled or swallowed in large amounts.

—Fireplace colors—metallic salts which produce colored flames—can be poisonous if eaten.

—"Snow" sprays—decorations which come in aerosol spray cans and look like snow—should only be used in a well-ventilated room. Inhaling the spray could cause vomiting or intestinal upset.

—USDHEW, Washington, D.C.

VADM G. W. CALVER RECEIVES THE DISTINGUISHED SERVICE MEDAL



The Distinguished Service Medal is pinned to the uniform of Vice Admiral George W. Calver by the Chief of Naval Operations, Admiral David L. McDonald. Doctor Calver, the first Attending Physician at the Capitol, was cited for his outstanding service to the Nation. The Admiral has served continuously on active duty since 1914 and has been the physician to Congress since 1928. He was placed to the inactive retired list on October 21, 1966. Doctor Rufus J. Pearson succeeded him as Attending Physician at the Capitol.

IMPORTANT NOTICE

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Existing regulations require that all Bureau and office mailing lists be checked and circularized once each year in order to eliminate erroneous and duplicate mailings.

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